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What's in a name?

Anapodophyllon? Podophyllum? It's still Mayapple!

Article and photos by W. John Hayden, Botany Chair

I am intrigued with words and word origins. I truly enjoy, each year, digging into the etymology of scientific names for our Wildflower of the Year. For plants of Virginia, perhaps the most convenient source for finding the meaning of plant names is *Gray's Manual of Botany* (Fernald 1950). Most common plants in Virginia will be found in this book, and despite that this work is some 75 years old, etymology of names is one aspect of taxonomy that never becomes obsolete. Nevertheless, I found little satisfaction in Fernald's explanation of the genus name *Podophyllum*: "Name from Greek, *pous, podos, a foot*, and *phyllon, a leaf*, probably referring to the stout petioles of the radical leaf." "Huh?" I thought. "Leaves form on stems, not roots—or radicals, to use Fernald's fancy word—surely Fernald ought to have known better!"

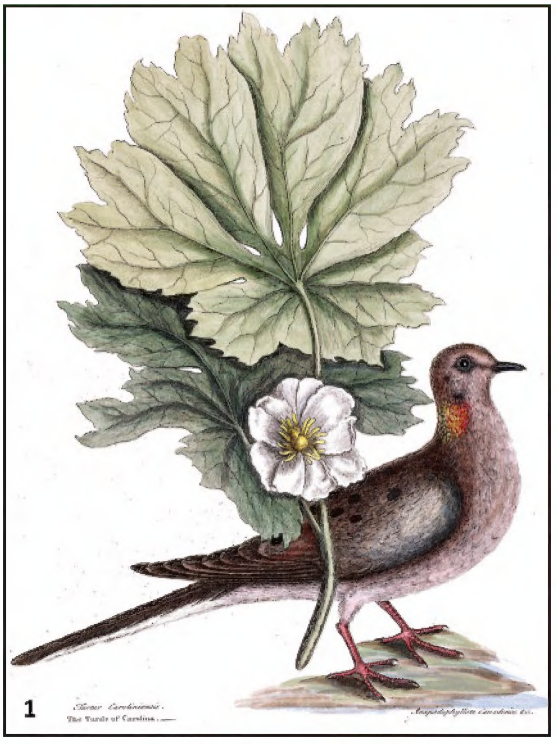

Figure 1. The first published illustration of Mayapple, with Mourning Dove, from Mark Catesby's *Natural History of Carolina, Florida and the Bahama Islands* (1731); Catesby, and others, referred to Mayapple as *Anapodophyllon canadense* Morini; colors lightly edited to restore white balance.

After a little digging into other literature, an intriguing story about the origin of the scientific name for *Podophyllum peltatum* emerged. Important sources that revealed the general outline of this story include Mark Catesby's (1731) *Natural History of Carolina . . ., Species Plantarum* by Linnaeus (1753), an article on *Podophyllum* growth from seedling stage to mature plant by Theo Holm (1899), and a detailed account by Marjorie F. Warner (1952). And I must hasten to add that, after figuring out most of the story, I came across an overview of the topic published by Marion Lobstein (2020).

Believe it or not, the story about Mayapple's name starts more than 400 years ago with Captain Samuel de Champlain, the French explorer who led multiple expeditions to lands that would become modern day Canada. During his last expedition in 1615, Champlain explored upstream along the Ottawa River, eventually making his way to Lake Huron; he then turned eastward to Lake Ontario. This route took Champlain into what is known to vegetation ecologists as the Carolinian Zone, that most southerly portion of Canada that hosts the northern limits of many plants – species that, otherwise, extend widely through the eastern deciduous forest biome. It was here that Champlain came across Mayapple—he recorded some brief notes about the plant for which he provided no name whatsoever. Nevertheless, his description of the plant and its distinctive fruits is unmistakable and his notes, just three sentences, appear to be the first published reference to Mayapple (Grant, 1907).

(See Look to history, page 2)

Insert inside!

2025 VNPS WOY brochure

Mayapple *Podophyllum peltatum*

Look to history for the entire Mayapple story

(Continued from page 1)

After Champlain, the next published works referencing Mayapple come from France. As tempting as it may be to suspect that Champlain himself introduced Mayapples to the 17th-century gardens of France, there is absolutely no evidence he did so. Nevertheless, we know that Mayapples were cultivated in France by the middle of the 17th century (Warner 1952). For example, Pierre Morin included Mayapple, which he called *Anapodophyllon*, in a catalog of garden plants published in 1658; in his list, Morin grouped *Anapodophyllon* with plants growing well in rich moist soil and flowering in May. Denis Jonquet in his "*Hortus Regius*" of 1665, expanded Morin's name to *Anapodophyllon canadense*, and Tournefort used the same name in his 1694 "Éléments de Botanique." Three significant points here: First, use of the word "*canadense*" is strong evidence that the early French garden Mayapples originated from the Carolinian Zone of southern Canada. Second, the name *Anapodophyllon canadense* is, clearly, a binomial name that predates our familiar Linnaean name for Mayapple by more than a half-century. And, finally, to the main point of this article, Tournefort explained the meaning of *Anapodophyllon* as "wild duck's foot leaf." If plant names are supposed to convey useful information, Duck's-foot Leaf, is eminently descriptive of the wedge-like toothed lobes of Mayapple leaves (Figure 2), and vastly superior to Fernald's simple translation of *Podophyllum* as "Foot Leaf."

Our Wildflower of the Year for 2025 was known in England as early as 1636, the name "Maye Apple" appearing on a handwritten list of plants that botanist/herbalist John Parkinson desired to acquire for his garden (Gunther 1922). The first published mention of *Anapodophyllon* in England appears in John Evelyn's "*Kalandarium Hortense*" (The Gardener's Almanac) of 1664 (Warner 1952). It is known that Evelyn visited Pierre Morin on at least two occasions; perhaps Evelyn's Mayapples came ultimately from Canada, by way of Morin—but, again, this is speculation. Later, John Ray's (1686) "*Historia Plantarum*," used the name *Pomum Maiale*, and mentioned that the plant had been grown in Cambridge (Warner 1952). Warner's narrative leaves the impression that when English gardeners refer to the plant as May Apple, those plants may have originated in Virginia. Details, however, are sketchy. Aside from Captain Champlain, all other 17th-century published references to Mayapples by French and English botanists stemmed from garden plants cultivated in Europe.

Figure 2. Lobed leaves of Mayapple, each lobe resembles a duck's webbed foot.

More than a century after Captain Champlain's brief notes, English naturalist Mark Catesby traveled extensively in the British Colonies of the American South and the Bahamas. Catesby returned to England in 1726 and spent 20 years preparing and publishing his monumental *Natural History*, the first volume of which (Catesby 1731) includes a depiction of Mayapple, paired with a Mourning Dove (Figure 1). Catesby called the Mourning Dove "Carolina Turtle Dove," and for the plant, he used Tournefort's name, *Anapodophyllon canadense* Morini. Intriguingly, Catesby's name for Mayapple is, fundamentally, in modern binomial form, consisting of a genus name, *Anapodophyllon*, a specific epithet, *canadense*, and the author of the name, Morini (Latin for "of Morin"). It would be another 22 years before Linnaeus' publication of *Species Plantarum* (1753) would make binomials the standard for scientific names.

For our beloved Mayapple, Linnaeus did not simply adopt the name that both Tournefort and Catesby had used, *Anapodophyllon canadense* Morin, and we do not need to wonder why he did otherwise, because he tells us, not once, but twice, in two publications that appeared in 1737—*Hortus Cliffortianus*, and *Critica Botanica*. The problem is that Linnaeus considered "*Anapodophyllon*" to violate one of his guiding principles about how genus names ought to be composed. In both *Hortus Cliffortianus* and *Critica Botanica*, Linnaeus characterized the name *Anapodophyllon* as "sesquipedalian"—too long (literally, a word that is a foot-and-a-half-long). Consequently, Linnaeus arbitrarily cut away the "*Ana-*" prefix from the name that had gone before, leaving just *Podophyllum* as the genus name. Evidently, Linnaeus had a strong opinion that 14 letters was too long, but that 11 letters was just fine. As a result, reference to

Figure 3. A large population of *Podophyllum peltatum*.

duck's feet in the scientific name of Mayapple became a nearly forgotten footnote in the history of this plant. Later, Linnaeus also dropped reference to "*canadense*" when he gave Mayapple its currently used binomial, *Podophyllum peltatum*, in *Species Plantarum* (1753).

Was Linnaeus' arbitrary action to shorten the scientific name of Mayapple an injustice to the botanists who had gone before? Certainly! Can anything be done about it now? Absolutely not! By long-standing international agreements about how plant names are governed, any name published before *Species Plantarum* in 1753 is irrelevant. On the whole, there is good reason for this policy. *Species Plantarum* was the first published botanical work to use binomial nomenclature consistently throughout the whole work and Linnaeus had done a thorough job of accounting for all the plants known to science at that time. Consequently, *Species Plantarum* is THE starting point for all matters of plant nomenclature; earlier names can be ignored when navigating the intricacies of formal nomenclature. Nevertheless, just knowing the way my own brain works, it will be a long time before I see a Mayapple colony (Figure 3) and not think, to myself, "Too bad we don't call it *Anapodophyllon* anymore!" ❖

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Consider becoming a Flora of Virginia Plant Ambassador

As I reflect on the highlights of 2024, one of my favorites was completing the Flora of Virginia Ambassador training offered through the Virginia Master Naturalist program. Learning is its own reward, but I must confess some additional delight at receiving a beautiful enamel pin and certificate at the end of my training.

In spring 2024, the Flora partnered with Virginia Master Naturalists, Blandy Experimental Farm, Lewis Ginter Botanical Garden, and Meadowlark Botanical Gardens to offer Ambassador training using a thoughtfully designed, hybrid model combining webinars, homework, interactive discussion, and in-person field work.

The training was more rigorous and detailed than I had expected; out of the 177 people who attended the introductory webinar, just 21 people completed the entire training. Do you think you have what it takes to complete this training in 2025? It will be open this year to members of VNPS even if they are not enrolled in the Virginia Master Naturalist Program. The first session starts in February.

Before the training, I had been using the Flora of Virginia app for a few years to help me confirm plant IDs after initially getting AI-generated IDs from other apps like Seek. I also regularly used it to determine whether certain species were documented as being native to specific counties when choosing ecologically valuable plants for my own garden or others who had asked me for recommendations. In my work coordinating the publication of the book *Plant Ridge & Valley Natives: A Guide for Gardeners,* I had relied extensively on the app for verifying plant nativity, traits, and phenology. I was surprised to learn in the training that there were many additional uses for this app that I had not even been aware of! After completing approximately seven hours of online training, in addition to homework assignments and field experience, I gained enough knowledge and confidence to offer a one-hour presentation to an audience at the Edith J. Carrier Arboretum. I also feel more prepared to lead wildflower walks and add appropriate plants to restoration and garden projects.

Please consider joining up to learn more about the Flora Ambassador program and consider embarking on your own training adventure! ❖

Anna Maria Johnson is the president of the Shenandoah Chapter. To learn more, go to https://bit.ly/FloraAppWebinar.Webinars are recorded for later viewing.

Native Plant Symposium draws record crowd

From the President
Nancy Vehrs

As I say to people all the time, the VNPS is primarily a *conservation* organization, not a garden club. But that doesn't mean that we don't like to garden with native plants! Many of us joined the Society through a love of gardening and embraced the conservation message along the way.

In early February I had the pleasure of serving on an outstanding team that presented the 7th annual Prince William Native Plant Symposium, our biggest yet. Representatives from governmental entities as well as local nonprofits collaborated to serve as a planning committee. This year we had Dr. Doug Tallamy as our keynote speaker, and he turned out to be quite the draw; we sold out for the in-person event at more than 300. Offered as a hybrid event, we had another 150 people register online and join from across the Commonwealth and beyond. The venue, the Science and Technology Campus of George Mason University located in Manassas, offered a large auditorium, as well as rooms for smaller concurrent breakout sessions, with all presentations recorded. To keep costs low for this all-day event, we were fortunate to secure many financial sponsors, including George Mason University's Office of Sustainability that shared the cost of the use of the facility and onsite technology team.

Society President Nancy Vehrs stands with keynote speaker Dr. Doug Tallamy.

Scheduling winter events can be dicey because of weather concerns. Alternate dates strain the availability of speakers. Caterers must order food in advance, and it is perishable. Regular in-person registration for the symposium, including lunch, was $45. As the symposium approached, we started hearing some forecasts for snow. Unfortunately, a winter weather watch was issued the day before the event, and it had our steering committee scurrying. If we made an early decision, we could move the whole event online. Unfortunately, we would incur the catering and venue costs and eliminate the prime opportunity to sell books authored by Tallamy. If we waited for the university to decide to close or close early, we would be unable to scramble and make the event fully virtual. We took a chance, decided to proceed and, despite the forecast, the temperatures stayed warm enough to melt the falling snow. Whew! Those who did not want to risk driving in the weather had the opportunity to change to virtual participation though we could not offer any refunds. And we donated leftover lunches to a food bank.

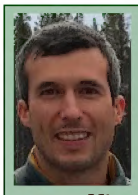
Takeaways from our symposium? The demand for information about native plant gardening is there with more than half of the in-person audience first-timers.

VNPS members Stephanie Johnson and Lois Montgomery stand in front of the displays at the symposium.

Tallamy's message in his presentation "A Chickadee's Guide to Gardening" was inspiring with his exquisite photos and clear speaking points. He asserted that we need to ask our landscapes to 1. Support food webs, 2. Sequester carbon, 3. Clean and manage water, and 4. Support pollinators. Gardening for beauty alone, which is what is achieved with using ornamental nonnative plants, is not enough to sustain our own life on Earth. For those who follow Tallamy, be on the lookout for his next book, *How Can I Help?: Saving Nature* with *Your Yard* will be available April 8.

On the conservation science front, the VNPS will host its annual workshop over two nights in March on Zoom. Education Chair Maeve Coker has an impressive lineup of native plant researchers who will share their results made possible from VNPS grants in "Advancements in Our Understanding of Virginia Flora." I hope that you will tune in. ❖

Study improves understanding of Smooth Coneflower



From Your Natural Heritage Program

Ryan Klopf
Virginia Natural Heritage Program
&
Rachel J. Collins
Roanoke College Biology Department

Biodiversity is a non-renewable resource essential for healthy, resilient ecosystems. Virginia provides habitats for over 3,100 species of plants (Weakley et al. 2012). Of these, 643 vascular plants are considered rare or threatened, and an additional 325 species are on the state watchlist (Townsend 2024). Rare endemic plants with limited ranges are especially at risk of extinction, and efforts to better understand and manage these species are critically important to efforts to protect biodiversity. *Echinacea laevigata*, Smooth Coneflower, is a rare, heliophytic, endemic found in southeastern grasslands including Appalachian glades. *E. laevigata* is state imperiled (S2) and federally threatened. In 2022, the U.S. Fish and Wildlife Service downlisted this species from endangered to threatened, as 44 populations, including 16 with good viability on protected lands, had been identified. Despite this progress, this species remains vulnerable, and greater protection and science-based stewardship remain fundamental for securing the future of this rare and beautiful element of biodiversity.

Recently a team of scientists and natural area managers from three universities, the Nature Conservancy, and the Virginia Natural Heritage Program completed a four-year study of the *E. laevigata* population within Den Creek Preserve. This study resulted in a paper recently published in the *Natural Areas Journal* (Collins et al. 2024). Den Creek Preserve is a 41-acre preserve in Montgomery County that was protected by The Nature Conservancy in 2007. Subsequent management has focused on glade restoration by thinning (i.e., removal of 2-15 cm DBH woody stems) and prescribed burning (i.e., prescribed fires in April 2009 and May 2021).

To better understand *E. laevigata* population dynamics, researchers tagged every plant within five subpopulations across the preserve. Tagged plants were measured annually (i.e., total leaf area), and further categorized as nonreproductive or reproductive. Additionally, 500 seeds were collected and planted into 10 baskets containing sterilized soil, which were then placed into a managed opening that did not have any *E. laevigata* growing nearby. Thirty-six seedlings from these baskets were transplanted into a nearby managed opening not close to any existing *E. laevigata*, where their survival was monitored.

Basal leaves of tagged *E. laevigata* growing in Den Creek Preserve.

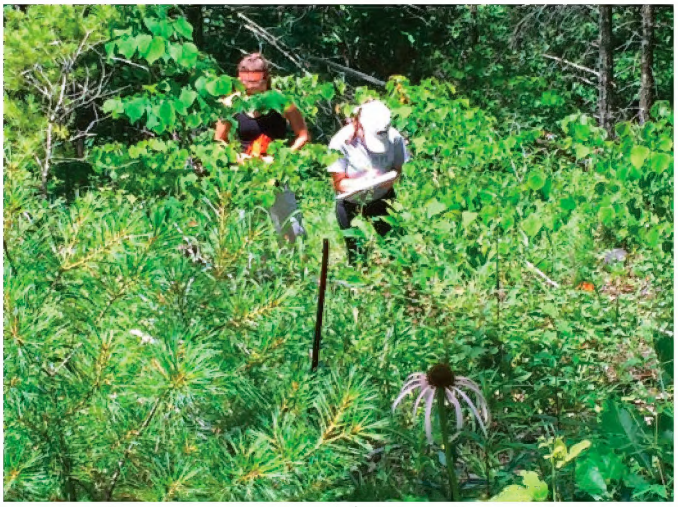
To interpret collected data, the researchers examined how plant size and flowering status affected survival, growth, and flowering in the following year. Additionally, researchers estimated the rate of population change with and without reproductive costs.

The size of the *E. laevigata* population within Den Creek Preserve grew each year, but the proportion of reproductive plants did not. Limited (<1%) dormancy was observed, and most (i.e., 77%) of the plants observed did not flower in any of the years of this study. Twenty percent of the plants flowered once, 3% of the plants flowered twice, and 0.3% of the plants flowered three times in the four-year study period. The planted baskets produced seedlings (72 after 1 year; and an additional 12 after 2 years), demonstrating some limited capacity for *E. laevigata* to produce a seed bank.

Plant size (cm^2) was the strongest predictor of survival, reproduction, and growth in the following year. In fact, plants with >100 cm^2 leaf area had nearly a 100% chance of survival the following year. Larger plants were also more likely to produce flowers. Multi-year observations documented a significant cost to flowering, however. Specifically, plants that flowered experienced a 6% decline in survival, a 16% decline in growth, and a lower chance of flowering in the following year.

The research team's estimates of population change within the preserve indicate that the Den Creek population is stable or growing. Thus, the legal protection

(See Study, page 6)


Roanoke College students assisting with field data collection.

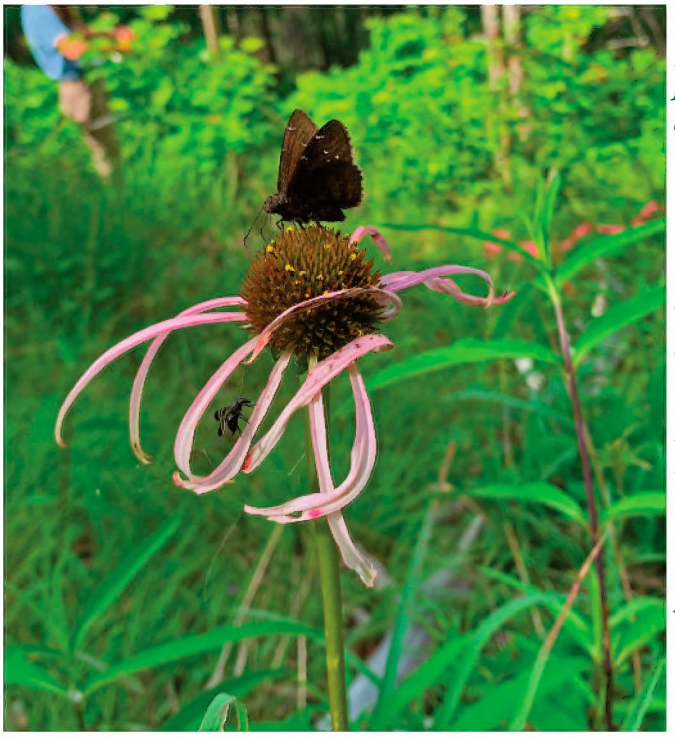
Managed glade habitat within Den Creek Preserve in April 2023.

• Study

(Continued from page 5)

combined with limited thinning and periodic (i.e., twice in 13 years) prescribed burning appear to be an effective combination for managing this threatened species. The research team's four-year project did provide more detail on which properties of an *E. laevigata* population are most important for population stability and growth. Simply put, larger populations containing bigger plants form the most stable populations. Thus, key implications for stewardship are prioritizing management to increase light resources (e.g., prescribed burning and thinning) available for growth and reproduction within larger populations. These management actions are well known to benefit glade ecosystems, which themselves contain other state rare and watchlist species.❖

Acknowledgments: Drs. Klopf and Collins wish to thank their coauthors on this research, Dr. M. Henry H. Stevens, Sam Truslow, and Dr. Ryan Huish. Dr. Steven's modeling work was especially valuable. The entire research team appreciates The Nature Conservancy for permitting this project within Den Creek Preserve.


Flowering *E. laevigata* within the study area.

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Next submission deadline:
April 1, 2025

Millipedes: the recyclers of the forest

For many, the forest is a calm, peaceful place, full of the sounds of birdsong and bubbling brooks. But beneath that seemingly idyllic calm lies a teeming understory bursting with life. Here among the leaves and moss crawl an untold multitude of bizarre creatures, eating, mating, and living their lives, largely unseen by the human world. One of the more fascinating and diverse groups of litter critters is Class Diplopoda, the millipedes (Fig. 1). These multi-segmented beauties are detritivores and roam the forest floor searching for decaying plant matter, from woody logs to moist leaves (maple and tulip poplar being their favorites). By breaking down detritus and pooping out bacteria and fungi-rich soil, they recycle valuable nutrients into the local ecosystem.

Millipedes get their name from their impressive legginess (milli – thousand, pedes – feet), with many species having hundreds of legs. However, it was only recently (2021) that a species was discovered with over 1,000 legs, from deep underground in Australia (Fig. 2). This species, *Eumillipes persephone* (*eu* – true, *millipes* – millipede) completely lacks eyes and has beak-like mouthparts, likely for eating fungus and bacteria found in the microscopic crevices of the Australian underground.

Figure 1: *Uroblaniulus* sp., a member of the "snake millipedes" (order Julida). Notice that each body segment has two pairs of legs, hence the class name Diplopoda (two-feet).

While no deep-dwelling millipedes with over 1,000 legs have been found yet in the Appalachians we do have one of the most diverse assemblages of Diplopoda in the world, especially in the order Polydesmida, the flat-backed millipedes. Polydesmidans have expanded body rings called paranota, which allow them to advertise their toxicity with bright colors contrasted against dark browns and blacks (Fig. 3). What toxicity you ask? Why, only one of the most deadly compounds known, hydrogen cyanide (HCN). But do not fear, unless you are the size of a pigeon, millipedes do not produce enough HCN to cause you any permanent harm, though we in the scientific community do not advise licking any millipedes you pick up, just in case.

Polydesmida is not the only group of millipedes to produce toxic chemicals, in fact, the vast majority of millipedes produce some sort of chemical defense, though most of these fall into the category of "just pretty stinky." From the fossil record (> 400 million years old) we can tell that millipedes were actually the first group of organisms to be chemically defended, as well as the first land animals to breathe oxygen. Millipedes are even older than the Appalachians themselves, and as the mountains rose up many groups of millipedes found themselves isolated on peaks and in gullies and caves.

Figure 2: *Eumillipes persephone*, the first "true" millipede with over 1,300 legs! Image by Aggyrolemnoixytes/Paul Marek - Own work, CC BY 4.0, https://commons.wikimedia.org/w/index.php?curid=113411993

Unlike insects, millipedes lack a waxy outer layer, which makes it relatively easy for them to dry out. Because of this, millipedes seek out moist, dark areas where maintaining their moisture content will not be a problem. Add in their slow movement and inability to fly and you have a recipe for diversification through isolation.

During the last ice age (115,000 – 11,700 years ago) the Appalachians provided a stable refuge for many plants and animals, which allowed species to persist and proliferate, hence the high biodiversity of millipedes, salamanders, etc. in the region. Currently, 10 of the 16 orders of Diplopoda are known from the Appalachians, with the majority belonging to two orders, the aforementioned flat-backed millipedes (Polydesmida) and the "sausage millipedes" (Chordeumatida). As previously mentioned, the Polydesmida produce HCN, and advertise their toxicity to potential predators with bright colors (predominately the family Xystodesmidae here in the United States). This has led to the development of mimicry rings, in which multiple species converge on a shared color pattern to better "educate" predators. The presence of mimicry rings is rather spotty in the Appalachians, with some localities containing multiple species sharing

(See Millipedes, page 8)

Figure 3: *Apheloria whiteheadi*, a member of the flat-backed millipedes (order Polydesmida). The contrasting yellow and black coloring advertises its production of hydrogen cyanide to would-be predators. Image by Benjamin Williams.

This conservation dog 'nose' its rare orchids

In a sea of trees and shrubs, detector dog Encore doesn't need his eyes to pick out a rare green orchid in Fort Walker, Va. All he needs is his nose and his handler's promise of a squeaky ball as a reward.

Trained dogs like Encore are helping conservationists in the Chesapeake Bay watershed. The U.S. Department of Agriculture's Maryland Detector Dog Program used the dogs' powerful sense of smell to eradicate invasive nutria harming wetlands on the Delmarva Peninsula. Now, dogs are setting their sights, or noses, on the rare Small Whorled Pogonia orchid in Virginia.

Small Whorled Pogonia (*Isotria medeoloides*) found at Fort Walker, Va.

Humans have long used dogs to detect everything from game animals to drugs and bombs. In the last 100 years, specially trained dogs have been used in conservation roles, too.

"In terms of conservation and wildlife, there hasn't been a large use, but I do believe we're starting to see that change, and we're starting to see more," said Trevor Michaels with the USDA Maryland Detector Dog Program.

Before he was a dog handler, Carl Dunnock was with the USDA when it was trying to eradicate nutria in the Delmarva Peninsula. The invasive rodents were introduced to the Blackwater National Wildlife Refuge and Choptank River in the 1940s so people could hunt them for fur. But the creatures often eat marsh plants and disrupt habitats.

Dunnock and his colleagues used traps and hunting dogs to locate most of the nutria. But the population eventually became too low for the hunting dogs to be effective. So, the USDA

Millipedes

(Continued from page 7)

a single color pattern (e.g. Cranberry Glades, W.Va.; Fig. 4) and others with up to six different color patterns in a single species (e.g. Hungry Mother State Park, Va.). The reason(s) for the isolated nature of mimicry rings in Appalachian Xystodesmidae are still unknown, though it may have something to do with predator pressure. The thinking goes that if predator pressure (i.e. number of predators) is low, for whatever reason, then millipedes with divergent color patterns can persist in the area, while the opposite would be true for areas with high predator pressure. A high color plasticity in a species may also be a beneficial adaptation, allowing the species to "experiment" with different colors to find the best warning for the local predator assemblage. As to what those predators are, many different animals eat millipedes, from birds to salamanders, as well as toads, mammals, and insects.

The second most speciose group of Appalachian millipedes is the Chordeumatida. Chordeumatidans lack chemical defenses and are often fairly soft-bodied (Fig. 5). Their main method of defense is crypsis (blending into the background) and running. Perhaps this is why the majority of Chordeumatidans in the Appalachians are found in subterranean habitats, such as caves, where predators are relatively scarce. Little research has focused on cave millipedes of the Appalachians but I, together with collaborators in Alabama, Georgia, Virginia, and other states, have amassed hundreds of specimens and hope to begin describing new species soon!

I hope this was a valuable introduction to millipede biology. If you have any questions or just want help identifying millipedes, please do not hesitate to reach out to me at jackson.means@vmnh.gov. ❖

Dr. Jackson Means is the Assistant Curator of Recent Invertebrates at the Virginia Museum of Natural History. His expertise is in millipede taxonomy and systematics, and his research focuses on American millipedes, specifically the Appalachian region as well as Brazil and Chile. Dr. Means is a native Virginian, growing up in the Charlottesville area, and is the often-exhausted father of three boys.

Figure 4: The Cranberry Glades mimicry ring, where species from three distantly-related genera have converged on the same orange and black color pattern to advertise their toxicity. A: *Appalachioria separanda*; B: *Rudiloria* n. sp.; C: *Semionellus placidus*.

Figure 5: *Pseudotremia* spp. (order Chordeumatida). The larger species is adapted for an epigean (surface) lifestyle while the smaller is depigmented, long legged, and has smaller eyes for a subterranean lifestyle.

captured, sterilized and inserted trackers into male nutria to locate the remainders.

"If we're potentially looking for a transient animal that could be moving up to nine miles a night, maybe we need another tool in our arsenal," Dunnock said. "And that's when we partnered with the National Detector Dog Training Center."

While hunting dogs were trained to chase nutria, conservation dogs were trained to find nutria scat. This method helped locate the last of the population and led to nutria being officially eradicated in 2018.

Then, the USDA unleashed the dogs onto new quests, such as finding rare orchids.

The U.S. Fish and Wildlife Service listed the small whorled pogonia orchid as threatened under the Endangered Species Act in 1982. It grows from Maine to Georgia. However, its population fell after decades of development and plant collection.

Researchers see orchids as "canaries in a coal mine." Senior scientist Melissa McCormick with the Smithsonian Environmental Research Center said they're indicators of environmental quality, needing both pollinators and mycorrhizal fungi from fallen trees to grow.

"They do all kinds of weird things, but it makes them so much fun," McCormick said.

Orchid seeds are too small to make room for nutrients. So, when fungi enter the orchid embryo, the flower absorbs nutrients by digesting the fungi. This relationship is difficult to replicate in the lab, and the Smithsonian is the only institution to do so. That means saving the orchids depends on finding and protecting them in the wild.

The U.S. Fish and Wildlife Service's plan is to learn how many of the flowers remain on protected lands, so researchers can manage them or save them from development. But the Small Whorled Pogonia orchid is difficult to find because its green coloring blends into the surrounding forest. The plants also hide underground when environmental conditions aren't ideal.

So the U.S. Fish and Wildlife Service decided to try detector dogs. Endangered species biologist Cherry Keller enlisted the program's help in 2022, launching the effort in partnership with the Smithsonian Environmental Research Center, North American Orchid Conservation Center and United States Botanic Garden.

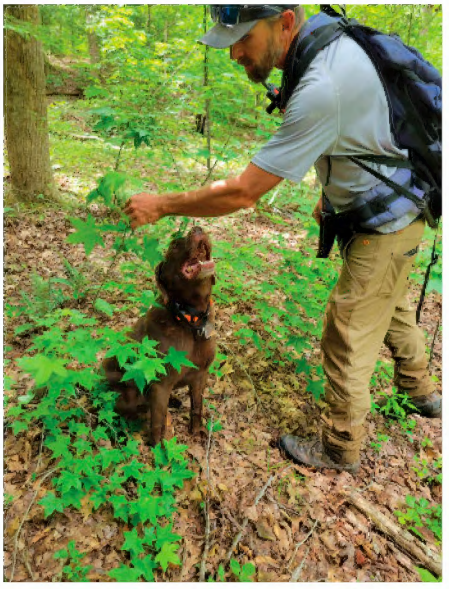
Handlers Dunnock and Carl Messick trained the dogs to find the orchids by placing glass vials in a room. Some held nothing while others held dried leaves from the plant. Over time, the dogs learned to sit and bark once they found the leaves. This way, they wait to get their favorite toy and won't accidentally trample the plant out of excitement. Then, the handlers tested whether the dogs could find the dried orchid leaves placed in tea bags outside.

Choosing the right dog for the job remains a challenge in the field. There is no standardized selection process or robust set of criteria.

The Maryland Detector Dog Program usually sources their canines from shelters and chooses youngsters highly motivated by toys. The dogs also need to perform well in water. So, the handlers often opt for labradors, like Encore and Grand, who were bred for hunting waterfowl.

The dogs found Small Whorled Pogonia orchids in Fort Walker, Va., this past summer. Keller said there's no current record of them in Maryland, but she can't be sure until they look.

Encore and Grand cover ground faster than humans by following their nose, McCormick said. The dogs employed by the USDA have surveyed



Dog handler Carl Messick inspects a spot singled out by his detector dog Grand in Fort Walker, Va. in June 2024.

more than 250 miles and found 320 groups of orchids. They found some in areas where surveyors said none were present.

"[The dogs] have definitely shown that they can find them better than people," said the USDA's Michaels.

Their noses are so fine-tuned to Small Whorled Pogonia orchids that they ignore mimics. They also bark at their handlers even when none are visible — it's likely the orchid is dormant underneath the soil. The handlers won't know for sure until the plants pop up in their own time.

The survey results will inform the 2027 U.S. Fish and Wildlife Service orchid assessment.

"It's the greatest job ever," Messick said. "We get to hike in the woods with our dogs every day and help the environment and help science."

Dunnock decided he will adopt Encore after the dog retires in six months. Encore will have to share the bed with Dunnock's first canine partner, Hector, who loves to take naps.

Article and photos by Lauren Hines-Acosta. Article originally appeared in the Chesapeake Bay Journal *and has been reprinted with permission from that publication and the author.*

New Mexico plant adaptations in black & white

Article and photos by Nancy Sorrells, *Sempervirens* Editor

In the decades that I have been serving as the editor of this newsletter, I think the articles that I have enjoyed working on the most are the ones about the amazing evolutionary adaptations that plants have created in order to survive and even thrive in what we might consider hostile environments.

In late September of 2024, a trip to New Mexico allowed me to see this clearly in black and white. And I mean, literally, black and white. This article offers some of those highlights first in the black lava fields that remain from a 5,000-year-old volcanic eruption and then from the fine white grains of gypsum sand. The lava fields can be visited at Valley of Fires Recreation Area (Bureau of Land Management, Carrizozo, NM) and the gypsum sand dunes are part of White Sands National Park near Alamogordo, NM.

The Malpais Nature Trail through the Carrizozo Malpais lava flow is fascinating. The black basalt rock, frozen in time into swirls, bubbles, and cracks, is one of the youngest and best preserved flows in the continental U.S. The lava emerged from vents in the valley floor. The flow is 44 miles long, 2 to 5 miles wide, and averages about 45 feet in depth. The lava fields are located at an elevation of 5,000 feet, experience an annual rainfall of 9-14 inches, and enjoy approximately 145 frost free days a year.

The hardened black lava from this 5,000-year-old flow at Valley of Fires Recreation Area in Carrizozo, NM, provides a surprisingly hospitable place for desert plants to thrive.

At first glance, the hardened black lava looks like an inhospitable environment for plants and animals, but that is not the case. Although the basalt is non-porous, plants germinate in the soil that collects in cracks and crevices. The small openings provide a protected place to grow and the black rock absorbs heat, providing a warmer environment through the night. Plants on the lava field are more robust and grow in greater abundance than in the surrounding area that lacks the lava.

Some plants found in abundance on the lava are Lemonade Berry (*Rhus integrifolia*), Fourwing Saltbush (*Atriplex canescens*), Mesquite, Apache Plume (*Fallugia paradoxa*), Sotol (*Dasylirion lucidum*), One Seed Juniper (*Juniperus monosperma*), Prickly Pear (*Opuntia engelmannii*), Algerita (*Mahonia trifoliolata*), and Soaptree Yucca (*Yucca elata*). Indeed, as I walked the paved trail through the lava field, I noticed that the plants were actually crowding each other. Perhaps the most impressive plant on the lava field is a 400-year-old Juniper tree that would have started from a seed dropped into a lava crack. Today this ancient Methuselah with its twisted, reaching limbs, stands as a silent guardian looking out over the lava field.

This 400-year-old Juniper began as a seed dropped in a lava crack.

The shifting sand dunes at White Sands National Park provide two wonderful examples—the Soaptree Yucca (*Yucca elata*) and the Skunkbush Sumac (*Rhus trilobata*)—of how plants can adapt to this harsh, hot, dry environment. These plants thrive despite the odds because of their adaptions. Imagine pouring tons of granulated sugar onto the landscape and adding wind. The results are dunes 40 feet or more in height that are always on the move. Sand piles up, sand blows away. Entire dunes can move nearly 40 feet in just one growing season. In addition to adapting to being buried in sand, plants must be drought tolerant and able to withstand temperatures below freezing and above 100 degrees.

(See Adaptations, page 11)

More than likely the roots of this Soaptree Yucca are many feet longer than its height as it grows both up and down to survive the shifting sand dunes.

Society fondly remembers Butch Kelly

A disruption has occurred on the forest floor of our wildflower community. Longtime Blue Ridge Wildflower Society member, leader, and friend Richard "Butch" Kelly (1942-2025) died after a fight with cancer.

In nature, a keystone individual refers to a single organism that has a disproportionately large effect on its environment and plays a critical role in maintaining the balance of an ecosystem despite not being the most abundant species.

There might be no better words to describe Butch and Betty Kelly. They have been members of our group since the 1980s. From the start, they have been leaders with outsized influence in our plant community.

For years Butch led walks, gave talks, served on the board, helped organize plant sales and shepherded our group as president, vice president, and newsletter editor. He often traveled to other groups and to schools to tell them about nature and what our club does. He also volunteered for field work with rare plants, such as Pirate Bush (*Buckleya distichophylla*) and Turkey Beard (*Xerophyllum asphodeloides*) for Virginia Tech and the National Forest system.

The married duo almost became one entity. While Butch often walked in front on a field trip, Betty was always making sure everyone was keeping up, had water and sunscreen, and offered words of encouragement.

As you know, a disruption refers to any significant disturbance that alters the natural composition and dynamics in an ecosystem. Disruptions can be large scale, such as a fire or a landslide. Or they can be small scale such as an insect damaging part of trunk but not hurting the entire organism.

In the beginning, the change is painful and unsightly, but that change also offers new opportunities and creates new beauty over time.

It would be fitting if we treated Butch's passing as nature responds when a giant emergent oak that towers above the canopy is blown down in a storm. We should each see the light opening and the disturbed soil as an opportunity to race into the space and fill a niche in our club.

Butch Kelly takes a break while on the trail leading a VNPS spring trip into the Great Smoky Mountains in 2015.

But remember, we are all volunteers choosing to be here out of love for nature and gardening.

Everyone has something to contribute, and each contribution adds to the beauty and diversity of our plant community. ❖

Michael Belcher, Blue Ridge Wildflower Society

Adaptations

(Continued from page 10)

The Soaptree Yucca survives by continuing to push its growth upward. The blowing sand might cover up the plant, but it will keep pushing upward to reach air and light. What looks like an ordinary yucca plant on the surface, might actually be perched on a tower of roots more than 20 feet deep. This fast and continuous push to the sky allows the yucca to thrive even as the sands build up on top of it. The problem occurs, however, if the sand dune then moves away, leaving the many feet of root system exposed. Without the sand around its roots to support the stem, the exposed plant will fall over and die.

The Skunkbush Sumac takes a different tactic. It establishes itself on the edge of a dune and quickly puts out an extensive root system that traps the sand and cements it together to form a hard pedestal. This solid base will survive even after the shifting sands have moved on, leaving the bushes on a platform several feet above the ground.

No matter where one visits in the natural world, paying attention to the plant life as well as the animal life, helps tell a much fuller story of the land around you.❖

The shifting gypsum sands at White Sands National Park have forced plants such as Soaptree Yucca and Skunkbush Sumac to come up with special survival techniques.

Workshop provides window to understanding Virginia's flora

Make sure to mark your calendars for the Wednesday evenings of March 19 and March 26 for the VNPS Annual Workshop via Zoom. "Advancements in Our Understanding of Virginia Flora" is the topic and Education Chair Maeve Coker has lined up a slate of dynamic speakers talking about everything from pollinating butterflies to the villainous Wavyleaf Basketgrass.

Each evening begins at 6:30 with a Zoom Meet & Greet, followed by welcomes and introductions at 6:50 and the programs at 7 and 8 p.m. Kicking off the workshop at 7 p.m. on March 19 will be Dr. Mary Jane Epps who will present "When butterflies beat the birds and the bees: Investigating an overlooked mode of pollination in *Rhododendron* and *Lilium*."

Epps, a biology professor at Mary Baldwin University, will discuss her work focusing on Flame Azaleas, *Rhododendron calendulaceum,* Mary Jane found evidence of 'wing-mediated' pollination via large butterflies. Springboarding from her globally significant flame azalea work, Mary Jane will discuss her continued investigation of wing-mediated pollination in other azaleas, as well as two *Lilium* species.

Hannah Machiorlete, an ecology research assistant at Archbold Biological Station in Florida, is the second speaker during the first workshop night. Her talk, "Clonal population structure is highly aggregated yet supportive of fitness in Common Milkweed (*Asclepias syriaca*)," will discuss how Common Milkweed achieves high genetic diversity despite its ability to clone itself.

The second evening session, on March 26, features Ohio University professor Dr. Harvey Ballard, at 7 p.m. He will showcase his research on understanding the incredible diversity of violets in Virginia and North Carolina where there are 57 known species in the *Viola* genus.

Dr. Carrie Wu, associate professor of biology at the University of Richmond, wraps up the annual workshop at 8 p.m. with her talk "Invasion dynamics of Wavyleaf Basketgrass, an emerging threat to mid-Atlantic forests." In her talk, Carrie will share some of her recent work that focuses on the early-stage invasion dynamics of Wavyleaf Basketgrass (*Oplismenus undulatifolius)* in U.S. mid-Atlantic forests.

Watch your email for a link to register for what will surely be an enlightening pair of evenings on Virginia's flora.❖

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